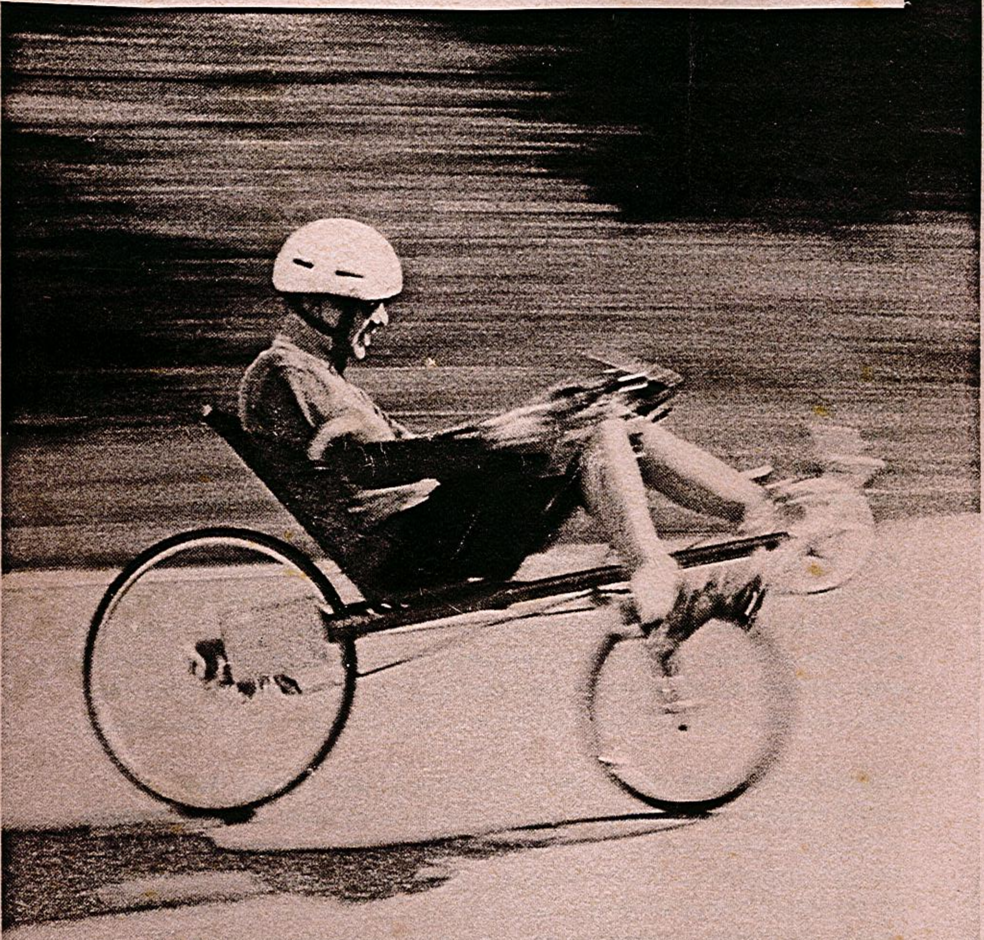
HPV TIMES

human power in motion



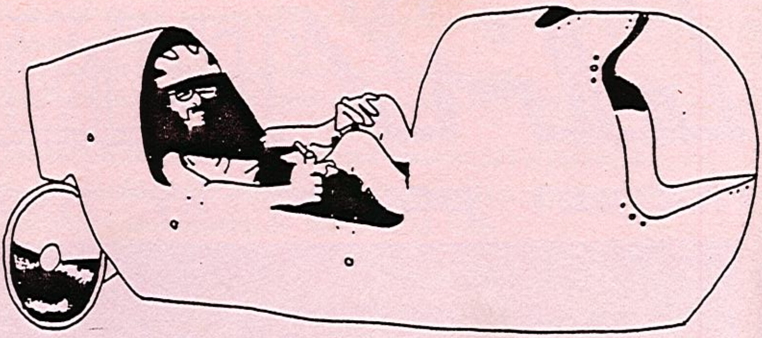
SPECIAL TRIKE ISSUE.

↑ KING CYCLE

Photo: Malcolm Heywood

vol. 3

in the editor's seat



Finally welcome to issue #3. HPVTimes has been expanding, both in size and readership. Started in October 1990, the level of interest in the magazine has been rewarding considering the time consuming effort involved in it s production. The first print run was twenty, the second fifty and the third will be one hundred. We now have several overseas subscribers, and most days I get an enquiry about HPVs or the magazine. This issue has suffered a little in priority, as a new son and the demands of work have made it a very part-time project. I have tried to concentrate this issue on practical tricycle considerations, with a long review of the Greenspeed trike, as well as several overseas models that seem practical and fun. The next issue will cover the major Australian HPV events and short wheelbase recumbent bikes.

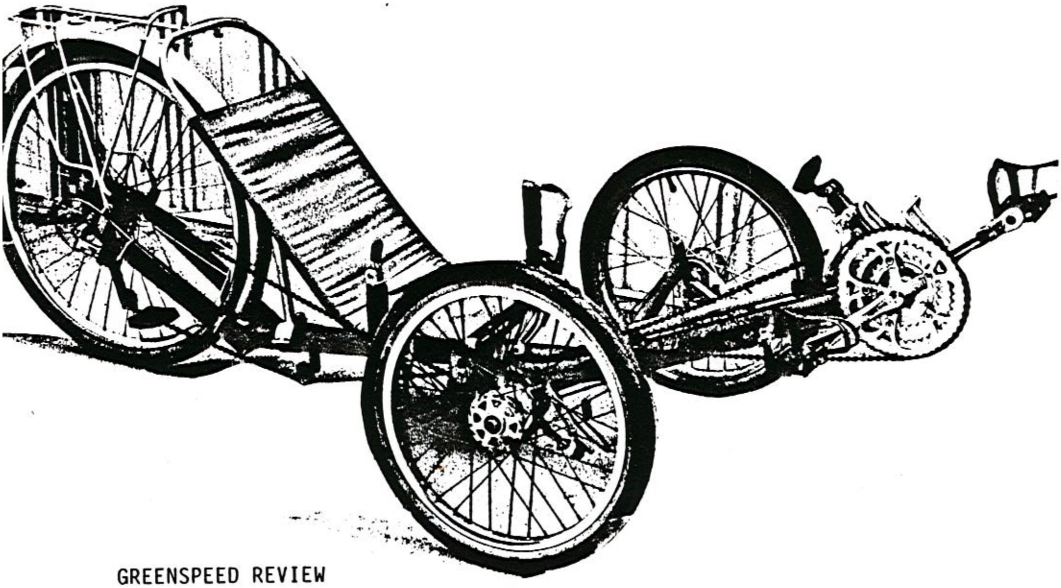
This is the first time I have computer set the magazine using a borrowed Amstrad with Microsoft Word 5.0 ,n fact it s the first time I have used a computer since uni. I have had some difficulties with the printer not recognising some characters which will explain what appears to be hand-written corrections scattered through the mag.. my apologies to the fastidious. Better luck next time around.

A quick note about our nearest neighbours. New Zealand has established a small, enthusiastic and growing band - HUMAN POWERED VEHICLES - which publishes a newsletter and has organised several HPV get-togethers. Their volunteer secretary, Tony Woodroofe (maker of the Rebel range of HPVs , was over in Oz for the January 1991 Energy Challenge, competing with a trike featured on page 17. Further details can be obtained from Tony at Ardmore Airfield, Private Bag, Papakura, Aukland. Tony has also offered HPVTimes and HPV users a place to stay if they are visting the land of the long white cloud.

I hope to see you all at the 1991 Pedal Power/HPVTimes HPV Challenge on the first weekend of November (the rain can stay away this year). ....Regards to all .... Wayne.

GREENSPEED

"Committed to a Greener Future"



GREENSPEED REVIEW

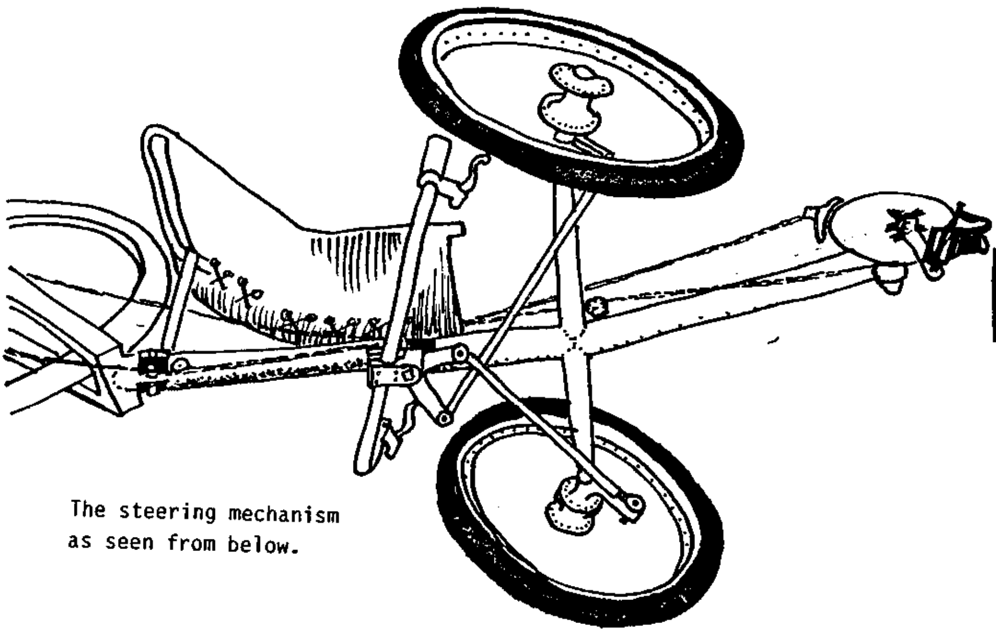
I'm not sure if it is the goading effect of having the speedometer in the centre of your vision, but Ian Simms' new Greenspeed trike seems fast. I'm a relatively sedate rider who is happy to be overtaken by the occasional steroid-using musclemachines, but the trike's higher speed saw me overtake more than my usual share of cyclists. Perhaps it is the startling sensation of being overtaken by something pedalling along at knee height, or the lack of cool involved in chasing an unknown lime-green trike that isn't drooping with the latest gruppo and funny bars. In fact, the Greenspeed could be all manner of things to different riders... to someone fit and accustomed to the position it could be a racer, to a BMX rider great fun, and to an older rider a more supportive leisure/shopping machine.

FIRST IMPRESSIONS

Ian's prototype was well used. Nearly 3600 kms were on the cyclocomputer. The paintwork was scratched in parts, and the frame tubes marked where the long chain slaps around. The aluminium rack attached to the seat frame had been damaged, and the waterbottle cage askew. Overall, it occupied a lot of space and looked heavy.

These impresssions vanished on the road. It was extremely manoeuvrable, and seemed to occupy little road space. While motorists still gave me a wide berth, I could still continue to sneak up on the left lane at the lights. The first day I thought the steering to be a little vague, in that it would tend to move around a bit at speed. To give the trike a tight lock the steering is geared mehanically up somewhat: any inappropriate steering action is exaggerated. After habituating this became less worrying, and short bursts unsteered or with one handle were fine.

To go fast required a few days acclimatising. No-one who rode it the first day could get it above 34 kph on the flat - and this was with considerable trying. However I think the sensitive steering made the drivers (myself included) unduly cautious. As the week progressed my average speed continued to rise - until I was quite surprised if not travelling at 30^{+} kph on all reasonable and flattish roads. Short or gently sloping hills could be tackled at cruising speed, and I never dropped to the smallest third chainring for the normally undulating quality Canberra roads. On long, steady climbs I tended to drop to about 16 kph which is sustainable with the heavier vehicle. I never had the opportunity to test it on steep hills as a combination of HPV visitors and rain dampened the weekend enthusiasm for a country tour and photos. The wide gear range should have been more than adequate.



The steering mechanism
as seen from below.

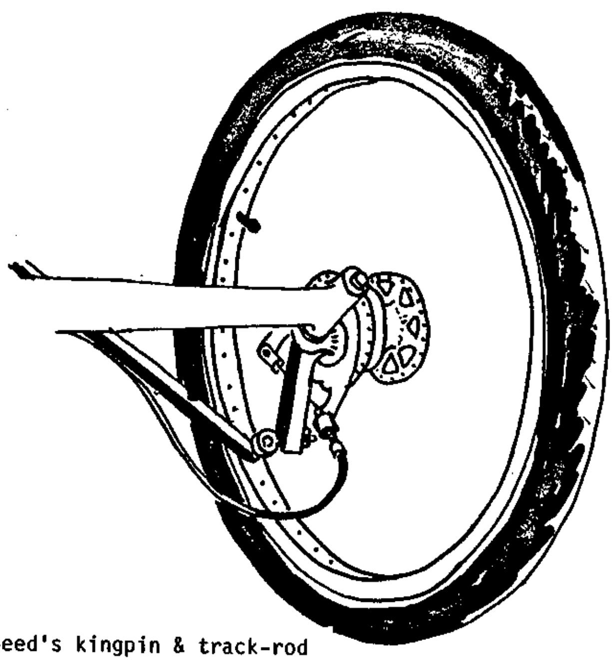
Stabilty is a very important trike consideration, and the Greenspeed's wide-ish track (80cm made for a very secure turn. It was quite exhilarating to pedal through tight corners to test this stabilty. Very little exertion is needed to change line, and I never lifted the inside wheel (much), although if you adopt full lock and continue to pedal faster and faster it will lift at about 20 kph. This gives a good safety measure for normal use. Race trikes are usually built as narrow as possible, but it is essential to lower the seat if possible. Ian's seat height is set at 250mm which gives a reasonably high eye-level - I felt comfortable in the traffic at that level, especially knowing the bright orange safety flag hinged to the rack alerted drivers who hadn't noticed me earlier.

DETAILS

Greenspeed has an all-steel frame, with a large (50mm) round tubular mainframe in a cruciform shape. The rear stays are 32x25mm rectangular tubes welded to a transverse square tube. The frame is simple and strong, with no detectable flex when entering or pedalling. The rear ends have been taper-cut into dropouts, and the front out-riggers end on inclined plain tubes into which bronze bushes are fitted for the king-pins. The bottom bracket (elevated 20 cm above the seat base) has an extension tube to mount the front derailleur and a tab for a headlight and/or a cyclocomputer. The frame and re-inforcing sleeves on the arms have been adequately electric-arc welded, and large aluminium rivets have been used to attach the lugs for the rear rack and the water-bottle. All cables are run in the outer housing and secured to the frame.

The sliding seat consists of a tubular steel frame with a stretched canvas fabric that is laced with 6mm shockcord. The seat frame is supported on the main frame with two collars, which are intended to be fitted with quick release toggles. Two rack lugs are also fitted to the top rear seat frame.

Steering is provided by a wide U-shaped handle-bar clamped in a conventional BMX stem and pivoted in a headset inserted in the mainframe. The two front axles are connected via adjustable rod-end bearings bolted onto steel tubes and secured to rabbit-ear like projections on the h'bar clamp. Both the kingpins and the hub axles appear to be high-tensile steel bolts which should have adequate strength. All the controls are mounted on the bars, which can be tilted to suit the rider.



Rearward view of Greenspeed's kingpin & track-rod

Teaming Huret-Sach drums with Shimano ATB levers provides excellent braking. The action is light and positive (and weather-proof), with the weight distribution preventing lock-up under normal conditions. As each lever is connected to only one side, rapid braking will cause the trike to drift towards that side unless resisted by steering. Initially I was cautious and never operated one, but eventually made use of this for sharp stops. Bands on the levers provide for parking.

COMPONENTRY

While capable of taking most cycle parts without modification, Ian has aimed for mechanically durable mid-priced items. The front wheels of 20 x 1.75" are laced with heavy 13g spokes, and the rear is a modular alloy 26 x 1.75 rim laced with plain 14g spokes. All wheels have hardy 1.5" slicks. The drive system, consisting of a non-indexed suntour h'bar shifter, wide cluster and XCD triple, provides a wide range of gears. Shifting was good and reliable, with the long chain controlled by four intermediate jockey wheels on the frame. I dropped the chain twice while riding a rough unsealed road - the chain length may need attention.

THE ENVELOPE PLEASE.

Overall, Greenspeed offers a fast and thrilling ride - mostly suited for good roads. There is room for the more committed user to fit lighter components to reduce the weight, but I had no real criticism of the choices made to keep the trike affortable. My only concerns, sure to be corrected in the final production are a slight instability in the steering and an annoying vibration due to the rigidity of the frame and tyres.

Since test-riding the trike, Ian has mentioned a number of changes - sealed bearing idler pulleys to reduce chain noise, grease nipples for the kingpins, straight through outriggers with lowered kingpins and locating the chain below the outriggers. He has also made some simplified smaller trikes to suit four and five foot riders.

Green tricycle GT 0001
Track 31", wheelbase 41", trail 2", maintube 2" x 16g.
20" x 1.5" Araya rims
Sachs 70 mm front drum brakes
20" x 1.75" I.R.C. Freestyle 45-80 PSI tyres
26" x 1.75" Mavic oxygen M6 rim
Suzue BMX rear hub
26" x 1.5/1.75 L.H.R. Mountain Tread 50-70 PSI tyre
Chainwheels 52-40-28, cluster 12,14,16,18,21,24,28,34
Gear range 113 - 21
Seat canvas with elastic cord lacing & quick release
Seat height 10"
Cateye computer CC-6000
Weight 21kg

GREENSPEED

Recumbent
Bicycles &
Tricycles

Ian M. Sims

69 Mountain Gate Drive,
Ferntree Gully, 3156
Phone: (03) 758 5541

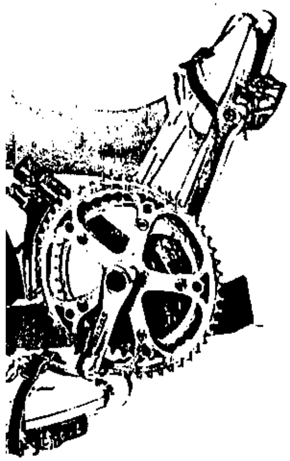
I would like to thank Ian for making the trike available for test-riding and hope to see many more Greenspeeds on the road and in HPV competitions in the years to come.

The Trice tricycle has gone through many changes since the first steel standard was produced about eight years ago by Peter Ross of Crystal Engineering (Cornwall UK). The original standard model was very stout with large profile 16" front wheels (shod with 340x37Vredesteins) and a 20x1 3/8" rear wheel with a backbone of 18g square steel tubing. I'm not saying it wasn't fun to ride but it did weigh 21kg (45lb). The latest offering has pared the weight considerably (ten pounds or four kilograms to be exact) but is still available with the original stability-enhanced trackwidth (80cm) or the narrower performance orientated width of 66.2cm.

7. older model is illustrated,
as the newer model photos are poorer

Called the Lightweight Trike, the new model is made apparently from an oversized aluminium round main tube with a smaller telescoping front aluminium section that contains the 'bottom' bracket and the small extension tube that houses the front derailleur. With the addition or removal of chain links the cranks can be adjusted to suit riders from about 5 ft to 6 ft 2" with six inches of movement. I say apparently because several brochures indicate a touring version that has a quality drawn steel frame and extension, but no mention of weight.

Wheels must be considered very important on a trike as the total rolling resistence is already increased by the extra tyre and cycle weight. All the wheels have been increased in diameter and reduced in width and are capable of taking over 100psi. The front 20 x 1 1/8" modular rims are laced onto Sturmey Archer Elite drum hubs (the saviour of mileage marathon vehicles) and shod with IRC Roadlite EX 1 1/8" tyres. The rear wheel is a standard 700C racing wheel fitted with a Michelin 23mm tyre. A small caution - as the track has been reduced and the steering wheels' size increased there comes a time when you must remove your hand from the inside bar on very sharp turns.



The Trice Recumbent Tricycle

Steering is achieved by fitting an inverted aluminium handlebar pivoted on Glacier DU bearings above the frame behind the seat mount. I presume there would be some provision for controlling the h'bar tilt. Short aluminium rods with rod end spherical pivots are used to link the extended h'bar clamp to the stub axles (above the side arms). Richard Ballantine in reviewing the Trice for New Cyclist comments - "the lightweight feels very good. I straightaway wailed it through a downhill off-camber corner, only afterwards chiding myself for impecunious behaviour with a new machine. As said the Lightweight likes to go. Balance is nice and even, without extreme under- or over-steer in corners. The steering method, upright bar ends alongside each thigh is comfortable. Only one hand is needed for control, a point appreciated as one learns - ouch! - to lift the inside hand on a full lock turn."

The seat, of fibreglass, is available in two colours (blue or white) and has a padded liner of foam. The seat top sweeps above your head and has a large extended foam head rest.

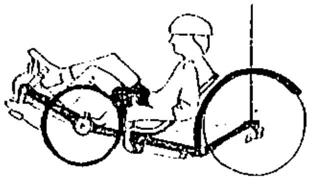
The rest of the trike uses standard componentry - the Trice Lightweight usually comes complete with Suntour indexing handlebar-end shifters, a six speed 13-28 block and a Solida 52/42 chainwheel set. This gives a gear range of 42 to 108 inches, which can be extended downwards with an optional triple (32/42/52) to a low of 32 inches. Optional equipment include mudguards (rear only on Speed, all wheels on Tour), Cateye Vectra cyclecomputermount, alloy rear rack, fluoro flag and mounts for front and rear Wonderlights (it's a wonder that anyone uses them!)

Most importantly the prices (mid 1990):

* standard Trice narrow track/24	rear wheel	£ 565
	frame only	£ 499
* speed Trice narrow or wide track		£ 699
* tour Trice narrow or wide track		£ 649
	frame only	£ 599

* options: triple chainwheel £ 15; rear carrier £ 10; wheel discs £ 30/wheel; mirror £ 15; computer mounting £ 10. When supplied frame only, all standard components are missing, but the front wheels are supplied. You can have any colour as long as it is red.

I'll leave the last words to Richard ..." in sum, the machine felt right from the very start, I want more, and as soon as I've seen off Christmas and the taxman, I'm having one for myself."



TRIKE STEERING GEOMETRY

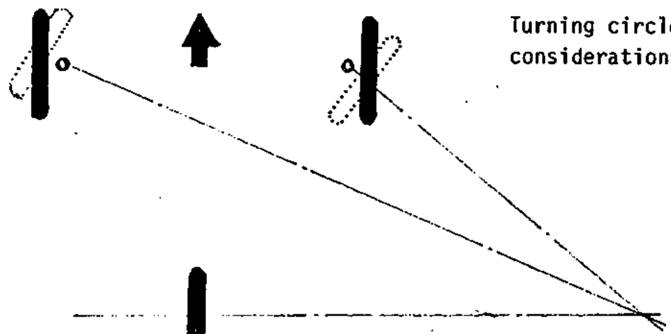
Not all the wheels of a cycle need to steer to enable the vehicle to turn. This is obviously the case with the bicycle, where the front fork is under the direct control of the cyclist. In the trike, there are a number of potential steering layouts, and it is the aim of this article to cover the most common one - future issues will examine rear steering, side steering and all-wheels-steering.

From a stability perspective it is desirable to have two wheels at the front - this is safer while braking and more difficult to roll with sudden deflections (ask me about the stitches I have received riding dual-rear-wheeled trikes). If we want to use a conventional drivechain system, with a rear driving wheel, then logically the front set must steer! Easier said than done. I get many enquiries about front-end trike steering and I usually recommend a basic steering mechanism based on external stub-axles and a geometry pinched from cars.

Let's consider a normal wheel: it can roll freely forward or be pushed sideways with difficulty (especially when loaded). The first is a roll, the second action is pure slip. The wheel and hence the vehicle moves sideways under slip. The basic aim of all steering systems is to minimise slip which can have dangerous consequences for the user. This means placing the wheels so that they roll around the curved paths we choose -this means that the axles must point to the centre of the turn. Since in our rear drive trike the back wheel is fixed (and hence it's axle must point to the centre of the curve) then the front steering wheels' axles must be made to point to the extended axis of the rear wheel, and at the actual centre of the turn (see diagram ONE).
The simplest method to do this should be familiar to anyone who has played with billy-carts. The front wheels are mounted on a beam and this beam is hinged to turn. This is a very simple method and is used in most mileage marathon vehicles as they don't have great stresses upon them. The beam is unstable as any cart-er knows - it wants to swing wildly with every bump - and is not recommended unless especially dampened and restrained.

The most common method, as found on almost all automobiles and racing HPV trikes, is to mount the wheels on short stiff axles that are hinged on the outsides of the frame. These STUB AXLES are usually T or L shaped -the vertical member (often called the KING-PIN) enables the axle to swivel inside bearings, while the horizontal member acts as the axle of the wheel. There are many ways of arranging the stub axle and it's support, as is shown in diag TWO. It is usual to use a stiffer stronger axle so that a fork-type support for the ouside end of the axle is un-warranted. For narrow hubs, it is possible to use 12mm (1/2") high-tensile steel or 15-16mm (5/8") mild steel bolts as the axles. The weight conscious will, of course, have these drilled out and/or tapered. It is possible to place small pads or springs on the king-pins to provide a small amount of suspension. Stub axles are like mini-beams, but they are much harder to deflect, partially because they are shorter and differently linked.

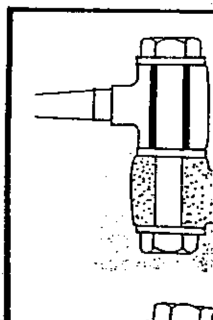
The stub axles are then coupled together by a track rod, that has bearings on both ends, which attaches to extensions on the axles (track arms). The track rod can then be tied into the steering system. The actual connection can be made to the track-rod or one of the track arms, and is dependent on the trike layout. Usually a seperate handle bar and headset are installed, and this unit is then linked to the track-rod or arm(s).

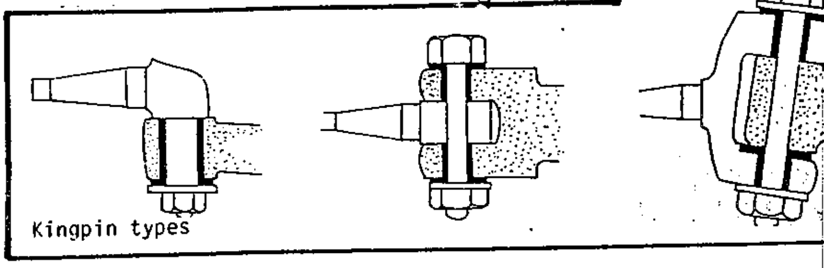


Turning circle considerations

Diagram ONE

Diagra





Kingpin types

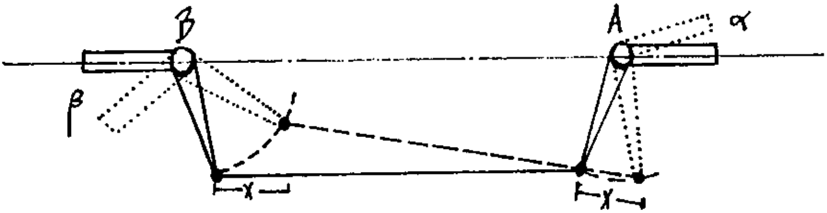
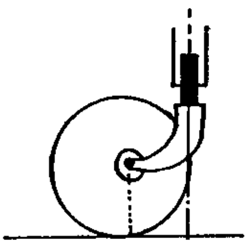


Diagram THREE
Variation in steering angle due to inclined trackarms

The simplest method to obtain the appropriate movement - where the inside wheel turns sharper than the outside one - is to orientate the track arms according to the Ackerman Principle. This gives a good approximation to true rolling, but it is always considered sensible practice to make your first model fairly adjustable, so you can fine-tune the orientation. If you consider that parallel track arms must make the front stub axles always parallel, then inclining the track arms to each other will alter the angles between the wheels as the stubs are turned. This is more easily illustrated (Diagram THREE): consider moving one arm through a set distance (x) - the other arm has to move through the same distance x. But point A is near the bottom of it's circle, while the point B is moving towards the side. This means that the movement x gives a greater angular turn to the track arm B. If the arms actually point at the centre of the rear wheel, the Ackerman orientation gives appropriate steering over most angles.



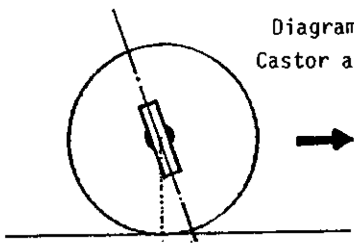


Diagram FOUR
Castor action

<u>CASTOR ACTION & TRAIL</u>

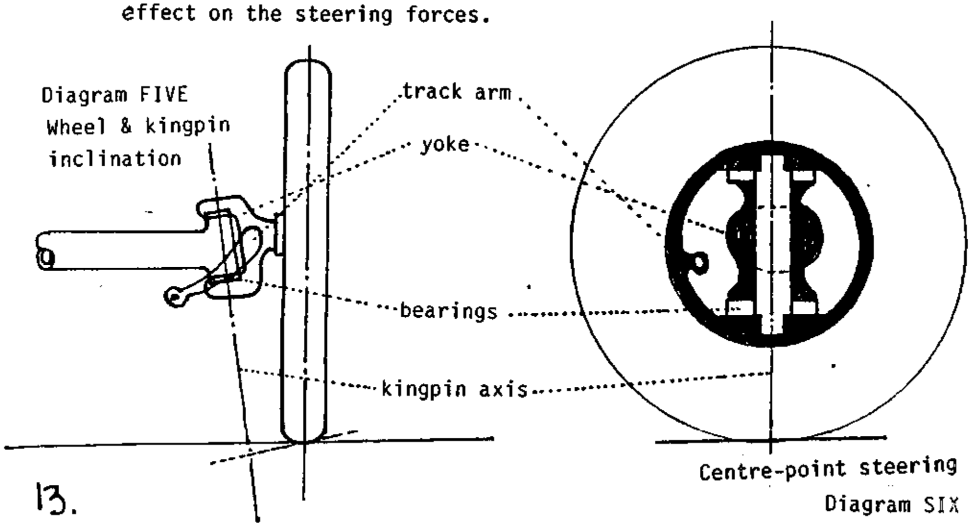
The kingpin can be pointed in a fore and aft direction so that it's intersection with the ground lies slightly in front of the contact patch made by the wheel on the road. The horizontal distance is called TRAIL, and the tilt is called the CASTOR ANGLE. This is analogous to the steering action of a bicycle fork or furniture castor. In effect, the wheel is being dragged behind the steering axis. This (positive) castor tends to force the wheels to move in a straight-ahead position, and also helps return the wheels to dead ahead after turning. Consequently, it also makes the steering theoretically heavier, but this is overcome by ensuring good leverage of the steering bars over the track arms. Trikes seem to use from zero to 80mm of trail depending on the wheel size: for instance, Greenspeed uses 50mm with 20" wheels which gives a castor angle of about 10 degrees.

CAMBER & CENTRE-POINT STEERING

Just as the kingpin axis can be ahead or behind the wheel, it can lie to the side of the wheel axis, as is seen in diagram 4. This inclination from the vertical is called CAMBER. When travelling ahead, the two wheels will tend to lag behind the pivots due to imperfect rolling friction. This rotates (or wants to rotate) the stub axles backwards, producing a compressive force on the rear track arms. On a smooth road with equal tyres, the two rotation forces will be small and equal, so that no effect is felt by the rider. However if the wheel forces are not equal then - as when one wheel hits a stone or is run off the tarmac - then the difference in force must be made up by friction, dampeners or the rider. The demands can be quite high, especially if the separation between contact point and the kingpin axis is large. In order to reduce this steering effort the separation must be kept small. If it is reduced to zero, true centre-point steering is obtained - a close approximation is considered good. It can be obtained by...

a. Keeping the kinpin vertical and inclining the wheel
b. Inclining both the kingpin and the wheel
c. Locate the kingpin within the plane of the wheel by using a special hub (diagram FOUR) in which case the road surface has no effect on the steering forces.

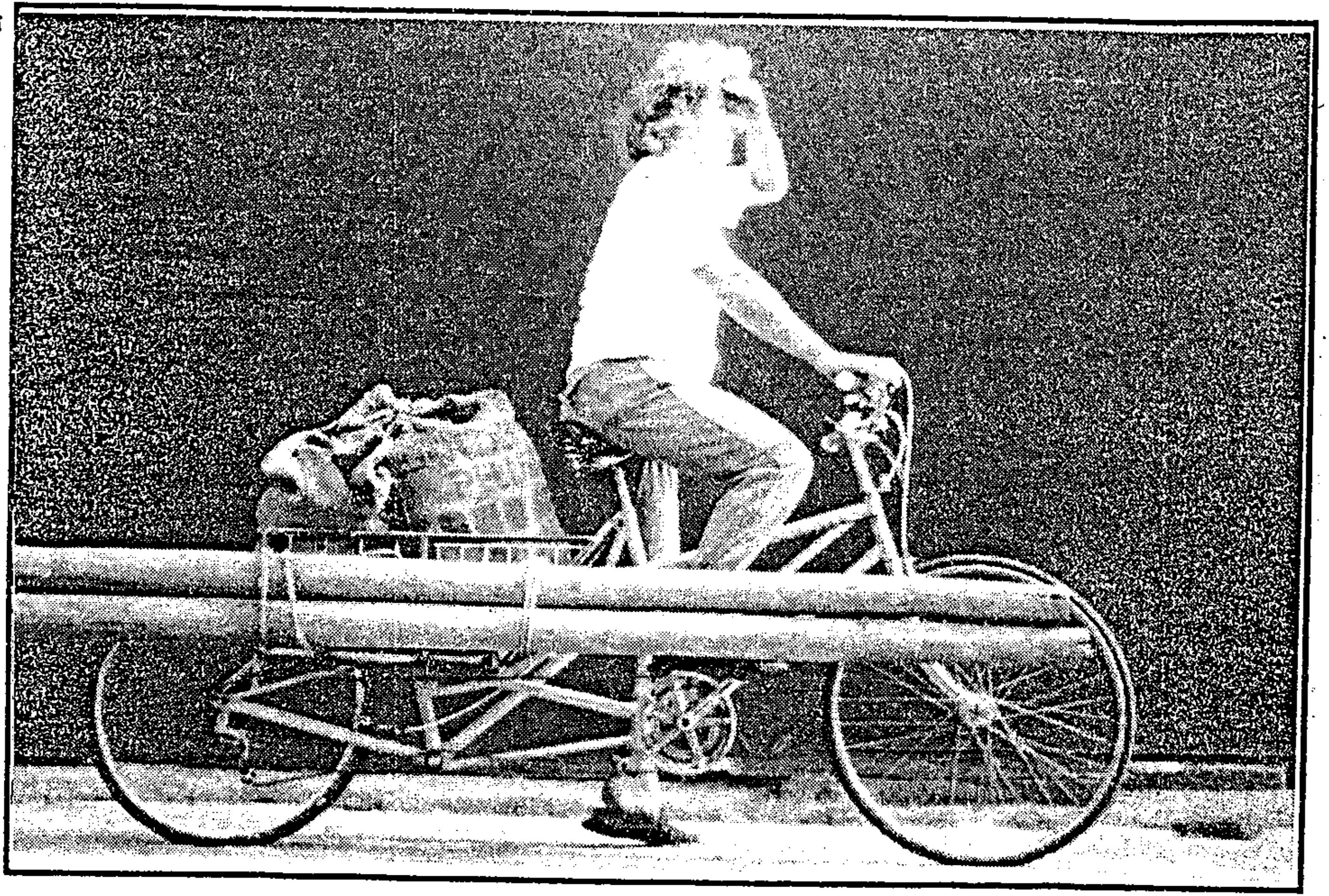
Diagram FIVE
Wheel & kingpin
inclination



Centre-point steering
Diagram SIX

An additional effect of inclining the kingpin outwards is to cause the trike weight to tend to centre the steering, as in any other position the body of the trike is lifted, as can be seen from the diagram... the point of wheel contact with the ground moves in a circle around it's pivot (the kingpin) and in a perpendicular plane to the axis. As it cannot push into the ground , when turned away from straight-ahead, it must lift the vehicle.

All this is basic steering theory, modified in practice by the imperfect nature of tyre/road interaction and the opposing nature of steering, braking and acceleration. It would seem that trike dynamics are quite complicated, but fortunately a wide margin of designs can work especially if some adjustability is incorporated. Ultimately, that is all we require.



IAN GRAYSON MODELS HIS REVOLUTIONARY UTILITY BICYCLE

HO CHI MINH

intermediate technology ...

Inspired by the extensive use of cycling technology in third world countries, Ian began to think about creating a purpose built load carrying vehicle that wouldn t have the trike s unwieldy aspects and keep the simple layout of the bike. The Ho Chi Minh is is basically a stretched standard upright cycle with a low load platform built behind the rider. Contained in a mesh basket, the load size can be greatly increased over that possible on a rack, without compromising pedalling position. It is more secure and more stable as it is lower than rack mounted luggage. It helps to think of it as a pedal powered ute. Stuff can be thrown in quickly and it is easy to unload. Ian made his own model out of two discarded bicycles; it s practicality caused him to abandon his regular ten speed.

As a framebuilder and as someone who has read extensively in the cycling literature, I think Ian's design is unique - most cycling inventions re-appear every twenty to thirty years (e.g. oval chainwheels, U brakes, trailers) - but I have never seen mentioned a stretch-bicycle as a utility cycle. The basic design Ian used depends on the largely un-modified use of the two old frames he had. Working from scratch instead could reduce the load height further and perhaps replace the large standard rear wheel with a smaller stronger wheel set further back. A wide range triple would probably be essential to recover the lost higher gears that a small wheel entails. This would increase the flat area available for luggage without affecting the overall length of the bike.

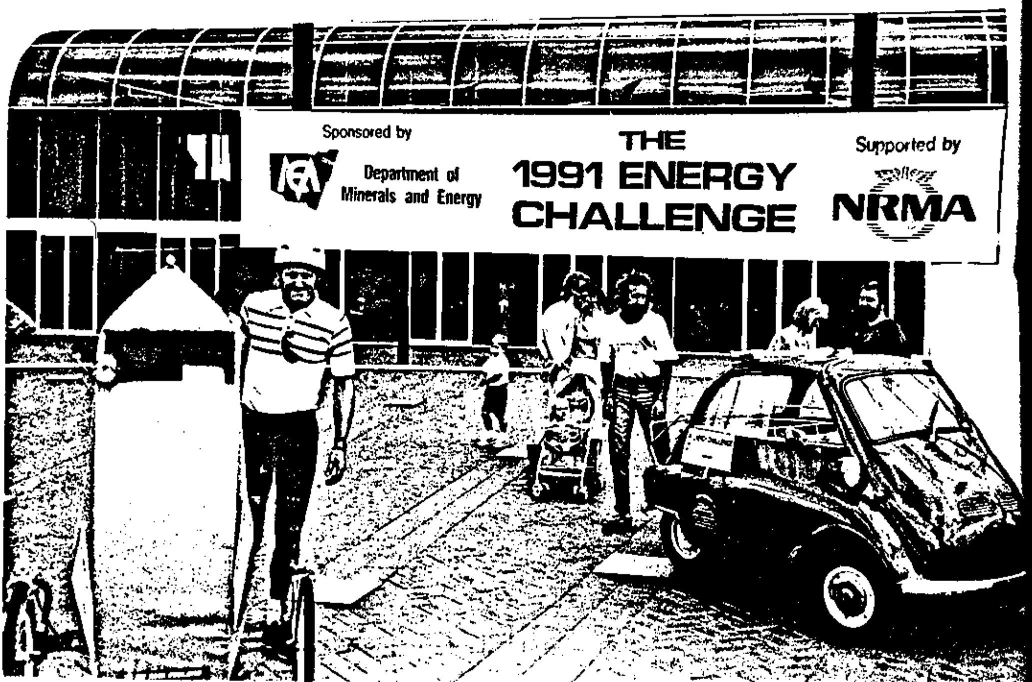
Ian has produced a very thorough do-it-yourself guide to producing the Ho Chi Minh which consists of five typed pages and a similiar number of illustrations & photos to augment the text. I'm sure he would be happy to send you this info for a suitable handling and postage fee. His current address is 35 Whysall Road, Greenacre, SA 5086.

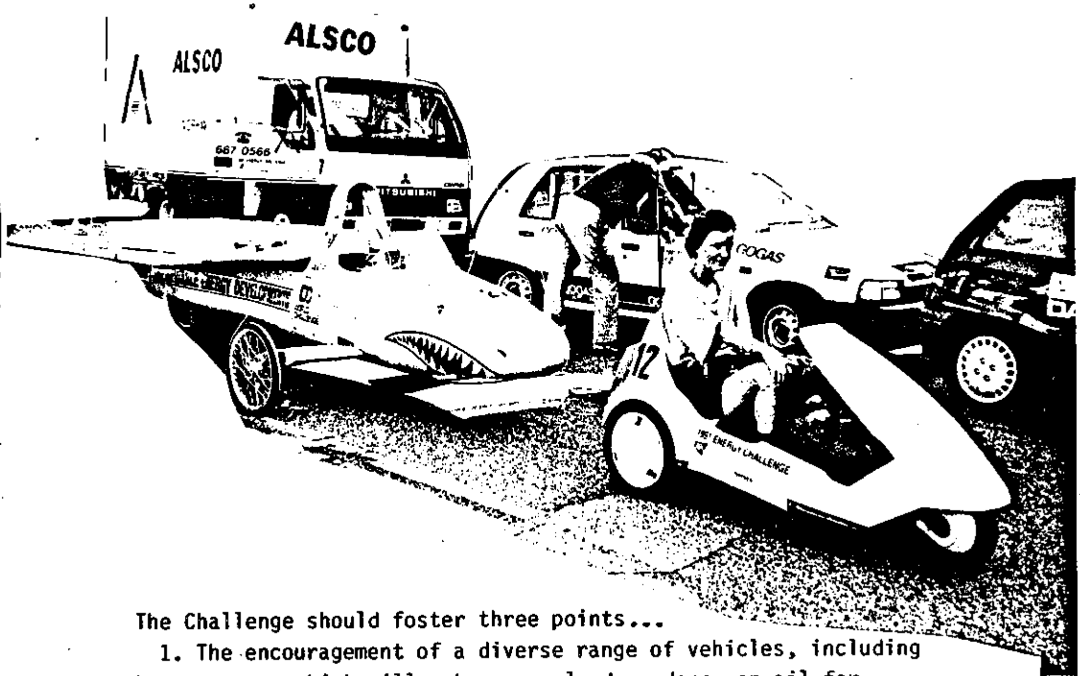
In view of its practicality and versatility I intend to produce a Ho Chi Minhfor carrying our baby boy as soon as as he is big enough, so I will keep you all posted as to its progress. If it proves to be as good as Ian's enthusiastic articles published in the cycling and appropriate technology magazines I may write a hands-on guide for using new materials and perhaps produce the frames for sale.

THE 1991 ENERGY CHALLENGE

Hans Tholstrup must be an energetic man. Fresh from running his initiated Solar World Challenge for solar-powered vehicles, he has encouraged the NSW Dept of Minerals and Energy (assisted technically by the National Road Motorist Assos.) to promote a city based transport competition.

The long, flat and relatively straight Darwin-Adelaide road that so suits the maximisation of speed and solar collection is a fairly atypical situation for most of Australia's private transport users. Situated as most of us are, on the coastal fringe in large unplanned cities, cars have a spagetti of roads to negotiate. The Challenge though, has it's part to play, which Hans considers to be the on-road testing of the new and modified automobiles of the future - "During the Challenge the vehicles of some inventors and fanatics that don't work will be proven useless...be it a car running on water or hot air, cold fusion, steam or gas from trees...none can survive the 1991 Energy Challenge without the truth coming out".





The Challenge should foster three points...

1. The encouragement of a diverse range of vehicles, including human power, which will make our sole dependency on oil for transport less significant & which can stretch our fuel reserves.

2. Provision of accurate on-road information on actual performance so that logical steps can be taken to alter the traffic mix towards thifty vehicles with low environmental impacts. Part of the data collected for the event is a Greenhouse Gas Index (GGI) that refers to the production of gases per payload per kilometre While this is of course only a part of the pollution produced it does reflect a growing concern to curb car pollution. The first Challenge is really a test-run to provide the data so that all the vehicles can be compared directly - the organisation will be able to incorporate the total energy required to produce, maintain and run the vehicles. I expect cycles to do quite well under these conditions.

3. The demonstration that fuel economy is often under the driver's control. Spectroscopic emission analysis and economy marathons indicate that poor tuning rapidly reduces economy. My humble Renault 16 (given to me for nothing) returns 50 mpg when tuned and quietly driven, probably 50% greater than most despite it being twenty years old. Lowering the maximum speeds by 10 kph will probably save 3-4% of our fuel per kilometre. One should note the average vehicle speeds in the table.

Results of the 1991 Energy Challenge

Entrant	Vehicle	Energy	GGI	Average speed (km/h)	Distance (km)	Fuel consumption
Alsco Linen Serv.	Mitsubishi Canter	CNG	26	46.7	373.1	13.4 kg/100 km
Natural Gas Co.	Toyota Camry	CNG	43	52.7	373.1	3.9 kg/100 km
Daihatsu Australia	Daihatsu Charade	Diesel	79	37	373.1	2.3L/100km
Daihatsu Australia	Daihatsu Mira	ULP	91	46.1	373.1	4.8L/100km
Melbourne Uni.	Ford Cortina	Hydrogen	116	35.7	130.5	1.7kg/100km
John Delacretaz	City Car	Electric	119	28.3	100.1	10.9kwh/100km
Go Gas	Daihatsu Charade	LPG	120	46.1	373.1	5.9L/100km
J. Calbin	BMW Isetta	Super Petrol	121	43.4	204	4.6L/100km
F. Diwell	Zeta Sport	Petrol/Oil	146	43.4	204	7.1L/100km

Solar Cars

Entrant	Vehicle	Energy	GGI	Average speed (km/h)	Distance (km)
Star Micronics	Solar Star	Solar	—	50.5	373.1
K. Rohrlach Museum	Team Barossa	Solar	—	36.0	288.4
AERL	AERL	Solar	—	33.3	177.5
D. Lalovic	Alarus III	Solar	—	23.0	200.7
M. Jansen	Rendev	Solar	—	15.4	89.8

Human Powered Vehicles

Entrant	Energy	GGI	Average Speed km/h	Distance (km)
Ross Lyle	Human	—	25.5	130.5
Rebel Cycles	Human	—	21.3	130.5

Different Routes Travelled

Entrant	Vehicle	Energy	GGI	Average speed (km/h)	Distance (km)	Fuel consumption
Q'land Cane Grws.	Rover	Ethanol/petrol	84	46.4	380.7	6.7L/100km
Q'land Cane Grws.	Daihatsu Charade	Ethanol/Petrol	93	44.6	373.1	3.8L/100km
W. Lloyd	Stanley Steamer	Kerosene	227	36.1	100.0	33.4L/100km

Two Human Powered Vehicles were entered; Ross Lyle from Sydney and Tony Woodroofe of Rebel Cycles in New Zealand. Tony, gathering from the amount of Air New Zealand stickers, must have had some deal going with the airlines! Both were trikes and had dual front steering wheels and rear drive. Rebel produce both bikes and trikes (see reproduced article from Rebel) and I think the trike can be dis-assembled and converted into a bike according to a spectator who saw the vehicles displayed at Darling Harbour, Sydney. I hope to have further information on both trikes in future issues of HPVTimes.

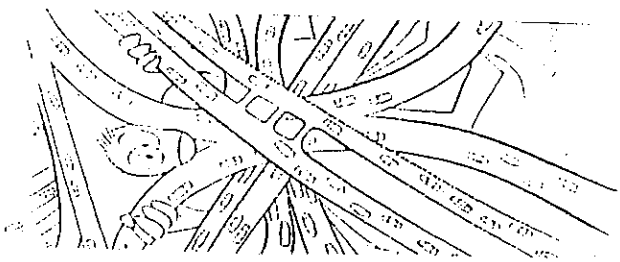
REFLECTIONS ON THE 1991 ENERGY CHALLENGE

In the past forty years, the number of cars in the world has grown to about 500 million. They have yet to reach widely into the third world where ownership is less than one per 500 persons. Here in Australia we have probably as many cars as we have children. What are we going to do about it?

Some-one once said that the car was a good idea, but the second one a nuisance. It has become a major component of our society, contributing enormously to the development of our cities and the high mobility of the population. It has altered the distribution of essentials such as food and clothing so that small local industries compete against materials bought across the country. The local shop has been replaced by the shopping mall in distant suburbs. It has made the road system one of the most expensive and expansive items in Australia. Like the television, it has homogenised society. Any pocket of Australia is concerned with the same things - new traffic arrangements, the cost of fuel, getting across the road, hoping your car doesn't break down, air pollution, parking!

The 1991 Energy Challenge is sponsored by the Department of Minerals and Energy and organised by Hans Tholstrup (of World Solar Challenge fame) as partial recognition that our basic infra-structure is built upon dwindling resources - we have less space, less oil and less air quality. This is, of couse, obvious to any cyclist, be it on a lonely stretch of backroad or braving the imperious attention of peak-hour drivers. The basic theory goes something like this: cars are a major cause of private pollution and oil consumption - perhaps we could make them more efficient and then things would be great again. The Challenge has much more of a job ahead if it really intends to grapple with the deterioration of our cities and the growing dependence on private transport.

Overseas the impacts have been more concentrated, and major studies are slowly coming to the conclusion that the car's domination of transportation must end. Gridlock (where traffic actually cuts off its own movement and sets solid) has been observed in places as diverse as London, Singapore and Los Angeles. Recent very high pollution readings in Sydney that carried health warnings is an ample sign that our planners will need to address this problem here. The World Climate Conference (Toronto 1988) recommended a reduction in carbon dioxide emissions to 80% of 1988 levels by 2005. The government can enact laws to restrict speeds (perhaps saving 6-10%) and encourage fuel efficient vehicles through pricing and regulation. But what do the projections tell us about the likelihood of success?



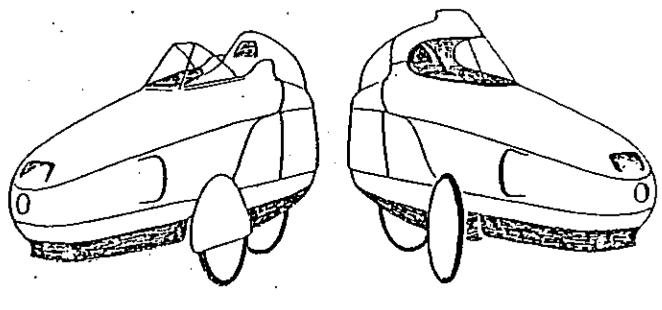
I think many factors will offset the potential good these government changes could bring. The major problem is the continuing growth of car use, with the increase in vehicles likely to maintain the same total pollution levels and the same road volumes. Additionally, the increased R&D spent in increasing fuel efficiency is usually negated by poor car servicing and tuning. An Energy Technology Support Unit report (Harwell UK based research company) in 1990 found that the amount of fuel used to move one person one kilometre in a car had increased slightly since the 1950s. This is despite the laboratory measured increases in fuel efficiency by 22% over the last ten years. These worrying factors are exaggerated by a world-wide decline in the public transport infrastructure, and the vast subsidies car and road producers receive, so that the actual costs of continued car usage are carried by all society.

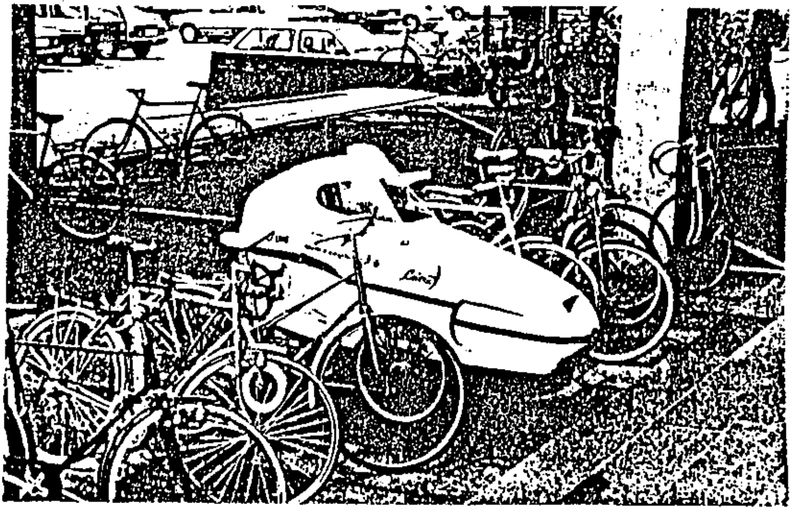
Reducing the need for the private car could be the answer. New expressways and roads which encourage more traffic will need to be stopped. Traffic speeds will need to be reduced significantly. On-road car costs will need to be substantially increased by such methods as parking, tolls and petrol taxes and ploughed into pedestrianisation, public transport and cycling. Technology - via the 1991 Energy Challenge - will contribute but without reducing the demands it could be a losing run-against-the-lights.

Leitra

Comfort and practicality are the guiding principles behind Carl Rasmussen's Leitra M2 trike. Both his earlier M1 and the M2 are approved by the relevant Danish road authorities, and Carl has put the trike into limited production. It is probably the most developed commuting and touring trike made anywhere. Careful attention to practical design, and the continual refinement that Carl has put into it since selling his old VW, shows. It is pleasant to find a serious product that doesn't sell on the basis of speed and low weight.

Based around a tubular frame, the M2 has a multitude of options, since it is designed on a modular basis. It can be used plain, with roll cage and guards for chain and wheels, with partial fairing (in three pieces) or full fairing and wheel pods. The full fairing, which weighs only 4kilogram, hinges up and forwards, making access simple. A wrap-around windscreen gives excellent visibility, with a flat safety glass centre section to guard against the scratch-induced blindness that comes with using plastics. A wiper can be fitted. Air vents, which are adjustable are fitted to the sides of the panels for power-plant cooling, and a special duct from the front directs air across the screen to prevent fogging. To provide full visibility the authorities required an interior rear-view mirror, which is accomplished by a convex mirror attached to the fairing roof and which looks out its own porthole.





The seat is a carbon-fibre/epoxy form, with wrap-around arm supports that lead to small platforms on which the rider rests their arms. This provides a very relaxed position, and easy manipulation of the control levers which rise vertically in front of these rests. The seat incorporates a 'groin support' to stop you sliding around, and cushions can be used to shape the seat exactly to your needs. One steering lever terminates in a bar-endshifter connected to a standard 5 or 6 speed rear dperailleur. All wheels are braked with internal drums - the two front are linked and the rear placed on the left. As this wheel supports 40% of the weight it should act as a good retarder for less than emergency stops.

Utilitarian aspects are plentiful. There are integral luggage pouches, like two large pockets, built into the sides of the fairing, and a rear shopping case that sits on an accessible rear opening. A recommended total payload of 100kg should provide for most touring and commuting needs. Lights, run of a battery located behind the seat, are set into the fairing, with a halogen front and standard rear. This gives a running life of 3-6 hours depending on the battery chosen. A small switch for the lights is fitted onto the left arm rest. Reflective side strips compliment the reflectors fitted to the rear and the wheel pods. While not acceptable to the Danish authorities, who insist on manual turn indication (through flexible side-flaps), the Leitra has turn indicator electronics and wiring built in, with a switch on top of the left steering lever.

The wheelbase is actually an equilateral triangle, with a track width of 90cm; this combined with an average centre-of-gravity height of about 35cm means that the Leitra will slide rather than overturn if traction is lost. The front wheels, which are sprung with shock-absorbing carbon/glass fibre can steer into a 2metre radius turn, which is quite tight.

Carl Rasmussen is quite clear on the disadvantages of the vehicle - the higher rolling resistance, the lower top speed compared to the aerodynamic HPV racers, and its weight (the older M1 weighs 25kg, no details for the newer M2). Coming as he does from a country with much of the year bitterly cold and with snow and ice on the road, his Leitra makes cycling possible, and in fact comfortable and safe. He had difficulty persuading traffic people to accept the vehicle as legitimate, and urges setting up an international standards/support group "to help people like myself convince lawyers and politicians that the development of advanced cycles is a serious matter, and not just a symptom of childish behaviour of a few crazy designers."

Carl can supply technical details (international reply coupons please) which can be obtained from LEITRA PO BOX 64 DK-2750 BALLERUP DENMARK. At the moment the Leitra sells for about 4,993 german marks - quick, rush to the exchange rate section of the newspaper - I was unable to estimate shipping which I think would be several hundred dollars by sea. The Leitra M1 was reviewed in the now defunct Bike Tech magazine, and copies of this and the Technical details can also be purchased from HPVTimes for a nominal $1.50

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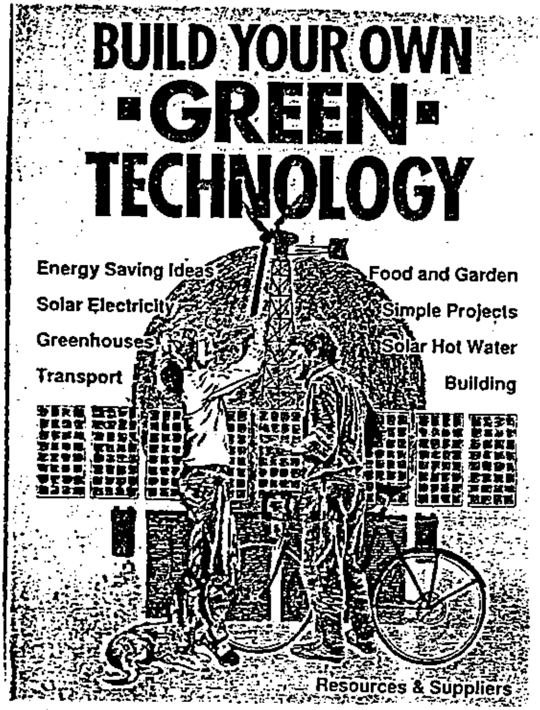

Published last year by the Alternative Technology Assos. of Australia, and based on items previously aired in their quarterly journal, Build.. covers a broad range of topics. loosely organised into six chapters. Of interest is a chapter devoted to transport - with articles on solar and electric cars, bicycle trailers (two and four wheeled), the Ho Chi Minh pedalling wheelbarrow and a steel rear rack. An additional pedal powered workshop module is discussed under appliances.

The articles are relatively short and have emphasised a practical matter-of-fact approach. While some knowledge may be assumed, the majority of the projects are simple and useful.

Fahrradpatente—*"Cycle patents"* assembled and discussed by Ulrich Herzog (in German). Moby Dick Verlag, Kiel, 1984.

This delightful paperback was sent to me by John Strozyk, to whom I am indebted. I am a strong advocate of looking at patents before claiming originality in anything, and perhaps even before one starts brainstorming. Finding the patents to examine is a fairly tedious business, better accomplished by commissioning experts. But here is a book of 191 pages in which about eighty HPV patents are reviewed. (The German word *Fahrrad* is not restricted to bicycles). US, European and British patents are displayed in seven principal topic areas (transmissions, brakes, and so forth). Generally the drawings are on a page to the left, and a description of the concept and a discussion are on the right. The period is supposed to be the last two-hundred years, but most of the patents were issued from 1878 to 1910. Two aspects give me a little concern. There were presumably thousands of cycle-related patents issued in this period: how were these representatives selected? My reading ability in German is not good enough to find an explanation in the introduction, but the author is to be allowed a license, and presumably he chose what interested him. Alas, the author perpetuates a myth in a historical table he reproduces: that of the Compte de Sivrac and his nonexistent precursor of the bicycle. Historical myths are like many-headed hydra: they are debunked, exposed and de-frocked, but they appear elsewhere undamaged but damaging.

These are small criticisms. We are grateful to have this excellent little book available, and to learn from the incredibly dedicated and highly skilled efforts of the pioneers.

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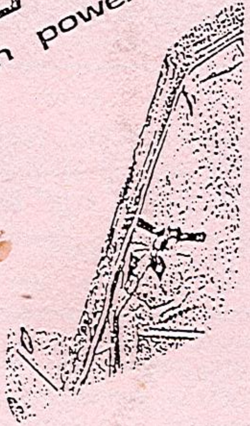

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